

UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA

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METRO FUEL LLC, a Delaware limited  
liability company,

No. C07-6067 JSW

Plaintiff,

vs.

CITY OF SAN FRANCISCO, a municipal corporation,  
COUNTY OF SAN FRANCISCO, a subdivision of the  
State of California, CITY AND COUNTY OF SAN  
FRANCISCO, a chartered California city and county.

Defendants.

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**DECLARATION OF JERRY WACHTEL**

JERRY WACHTEL declares under penalty of perjury, pursuant to 28 U.S.C. § 1746, that the following is true and correct: JERRY WACHTEL hereby declares under penalty of perjury, pursuant to 28 U.S.C. § 1746, that the following is true and correct:

1. I am the President of the Veridian Group, which was established in 1982 to provide consulting services to Government, non-profit and corporate clients in areas of human factors and ergonomics, including: human performance; visibility and conspicuity; hazards and warnings; simulation; training and assessment; expectancy and situation awareness, distraction and attention; roadway design and traffic control devices TCDs); and positive guidance concepts. My background includes more than 30 years of experience in research, project management, and consulting at all levels of Government and in private industry.

2. I have served as an expert witness in the areas of traffic safety, human factors, ergonomics, and engineering psychology in dozens of cases. I have never been denied

qualification as an expert witness in any of those areas. I have served as an expert witness in cases in Alaska, Arkansas, California, The District of Columbia, Montana, New Jersey, Oregon, Pennsylvania, Virginia, and Washington.

3. A true and correct copy of my CV is attached hereto as Exhibit A.

4. I performed a field study of certain advertising signs in San Francisco at the request of Metro Fuel LLC (“Fuel”). The purpose of the study was to assess the design, placement, and operational characteristics of representative Fuel signs as well as advertising signs on street furniture placed on public property within the City of San Francisco (the “City”) with specific regard to traffic safety and the potential for driver inattention and distraction. It was explicitly recognized that the City has the authority as well as the responsibility to regulate commercial signage within its jurisdiction in furtherance of its mandate to protect public safety.

5. My field study sought to determine whether the City was objectively and neutrally engaged in this practice vis a vis commercial signage.

6. As discussed in greater detail below, I conclude that the Fuel panel signs that I observed, without exception, cause me less concern about the potential for driver distraction than the advertising signs on the City’s street furniture structures.

### **Background Regarding Driver Distraction Issues**

7. Driver distraction is a subject of much current interest in the highway safety field. Until 20 years ago, the subject was nearly unknown to researchers, regulatory officials, and enforcement authorities. Police traffic collision report forms provided no opportunity for an investigating officer to identify distraction as a factor in a crash; the closest categories were “inattentive driving” and “fell asleep at the wheel.” The popularity of the cellular telephone and the increase in accidents that are now known to be typical of inattention and distraction led to

research which continues unabated to this day (2,3).<sup>1</sup> As vehicle manufacturers and after-market suppliers continue to introduce new “infotainment” devices into vehicles, the problem of distraction has become much clearer and of greater concern (4,5). Today, it is hardly possible to find a scholarly text on human factors and traffic safety that does not devote at least a full chapter to the subject (6,7).

8. However, with few exceptions over the years, the focus on driver distraction has been concentrated on sources inside the vehicle. Much less attention has been given to the risks of distraction from sources external to the vehicle (8,9). But with the proliferation of attention-commanding advertising signs, the increased visual complexity of the roadside environment with which drivers must cope, and ever increasing traffic density, regulators must ask whether restrictions are necessary to reduce the potential for driver distraction resulting from sources outside the vehicle. As a result, research has been conducted, world-wide, both in the laboratory and in the field, and recent studies have begun to show that such external factors, primarily outdoor advertising signs, can attract a driver’s gaze and attention, often for extended periods of time (10,11). When such behavior occurs when the driving demands are high, as they can be at certain locations in San Francisco, the concern about the potential for driver distraction is heightened.

9. Although we think of driving as predominantly a visual activity, everything that is observed must be processed by the brain before a driver can take any action based upon the visual scene. Thus, driving is also a cognitive task – one in which the driver must be attentive to the constantly changing environment through which he is moving. This environment includes the

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1. Numerical references in parentheticals are keyed to the appendix of endnotes that is attached hereto as Exhibit B and which I hereby incorporate into this declaration as if fully set forth herein.

road or street, the vehicle being driven, visibility and weather conditions, other vehicular, pedestrian and bicycle traffic, the rules of the road, and the surroundings in which the driving task must be performed.

10. Considerable research has clearly demonstrated that driver distraction or inattention is a significant cause of crashes (12,13). Distraction can result from characteristics of the driver himself (e.g. fatigue, illness, the influence of alcohol or drugs, daydreaming), from sources inside the vehicle (e.g. other passengers, cell phone conversations, adjusting the entertainment or navigation system), or from the stimuli in the environment that attract the driver's attention away from the forward roadway (e.g. scenic vistas, outdoor advertising signs, road construction, accidents, etc.). While many of these distracting activities can be, and have been, regulated by agencies responsible for road safety (e.g. cell phone use, driving under the influence, use of navigation displays while in motion), others are not within regulatory authority. Outdoor advertising visible to drivers has long been regulated on Federal and State roadways, but under narrowly defined circumstances (14).

11. Advertising in all forms is intended to attract attention so that the sponsor's message can be communicated to the observer/viewer. Indeed, the root of the word advertise comes from the Latin *advertere*, "to turn toward."

12. Human vision is neurologically prewired to be attracted to certain stimuli. Specifically, objects that are brighter than others in the visual field, and those that move, flash, or appear to do so, are likely to capture a person's visual attention more compellingly than objects that don't possess these properties. Of course, once a person's gaze falls upon such an attention-getting object, the eye may not linger on it – at some point the content or salience of the message becomes more important in holding the viewer's attention if the object is to be fixated for any

length of time. If the message holds no salience for the viewer, or if the message is irrelevant, the eye may move to other objects in the visual scene.

13. In driving, one must attend to many different objects in rapid succession. Other vehicles nearby, traffic signs, signals, and markings, the instruments in one's vehicle, the side and rear view mirrors, pedestrians, bicyclists and other road users, unexpected hazards, and other stimuli must all receive attention from the driver. This attention must be shared between these objects constantly (since the human is known as a *single channel information processor* with a finite cognitive capacity) and, to do so, attention must be quickly shifted from one object to another when the driving, traffic, or weather conditions require it. Traffic safety authorities have long understood the key characteristics of visual attention as discussed above, and have used this understanding to further traffic safety by ensuring that certain, more important, objects in the visual scene are designed and placed to increase the likelihood that they will be noticed and attended to. Examples include: flashing lights on emergency vehicles, red traffic signals, boldly striped crosswalks, alternating red lights demarcating obstacles, and distinctively colored warning signs where higher alert is necessary, such as orange for construction zones and "bright yellow green" for school crossings (1).

14. Recent studies have shown that, when the eye is distracted from the forward roadway view (which is the heart of the driving task) for longer than a brief interval (values from 0.75 to 1.6 seconds have been cited), the possibility of an accident may be increased (15,16,17). This forward roadway view is the center of what is often called the "cone of vision." Typically, the cone of vision is defined as the number of degrees on either side of the forward view in which human visual acuity is best. In driving, the cone of vision is commonly described as +/- 10-12 degrees offset from the centerline of vision in the horizontal plane.

15. An understanding of the cone of vision is vital to the discipline of human factors in traffic safety. It is based on the understanding that driving is primarily a visual task, and that a driver must be principally attentive to the forward field of view. As a result, traffic control devices (TCDs), which include official signs, signals, and markings, are required to be located within the cone of vision (1), and it is generally recognized that visual stimuli (such as advertising signs) that are irrelevant to the driving task should not be placed within this zone (14).

16. But the highway safety professional cannot wait for accidents to occur before intervening to reduce future accident likelihood. This is because accidents are relatively rare events (in terms of total vehicle miles driven daily), they are rarely reported to the police, and they are often a result of several interacting factors. It is for these and other reasons that traffic safety specialists look for other measures of risk – measures such as driver eye movements, situation awareness, reaction time, near misses, etc., as surrogates for actual crashes.

#### **Relevant Characteristics of Concern of Outdoor Advertising Signs**

17. Based on my experience with the design and operation of traffic control devices, and with concern for the potential distraction effects of roadside advertising devices, I developed a general list of advertising sign characteristics that could contribute to driver inattention and distraction. This list includes:

- a. Size. Other factors equal, the larger the sign, the more likely it is to capture a driver's attention.
- b. Height above road grade. Recent research (18) has shown that advertising signs which are mounted above a driver's horizontal line of sight are likely to be observed less frequently during demanding driving conditions, and

more often when task demands are comparatively light; conversely, signs closer to grade level are more likely to be observed as a driver performs his normal scanning for potential traffic hazards and for TCDs. As such, an attention-getting sign closer to grade is more likely than a comparable sign that is elevated to capture a driver's attention during critical driving tasks.

- c. Line of sight. A sign that is closer to the road edge (or curb) is more likely to be within the driver's cone of vision, and, therefore, more likely to become a distractor than a comparable sign which is further from the road edge and therefore beyond the cone of vision. Recent research (19) supports this conclusion.

### **Conduct of the Field Study**

18. During the course of two days (6/29/08 and 7/5/08), I was driven along certain streets within San Francisco. I selected these streets because they included locations of typical Fuel signs, and because they represented several different types of driving environments within the City. The field study was spread over two days because I wanted to obtain both daytime and nighttime data, and because Market Street, one of my chosen thoroughfares, was closed to traffic during my first visit. In addition, I revisited a subset of the locations on a third occasion (7/13/08) to verify the accuracy of recorded data from the prior visits.

### **Results of Field Study**

19. In the subsections below, I have identified the key characteristics of the signs of each type that I observed during the Field Study. Where appropriate, I have included a discussion of how these sign characteristics relate to issues of traffic safety.

### **1. Distance From Curb Line**

20. When measured from the curb to the nearest edge of the visible sign face, advertisements on bus shelters were typically set back by approximately 26 inches; those on news racks were set back by approximately 18 inches (although in some locations news racks were set back against buildings that faced the street, and at some sites were set in or adjacent to street level plazas away from the street); those on triangular kiosks were set back approximately 33 inches from the curb; and those on round “public service” kiosks were set back approximately 31 inches from the curb.

21. Fuel’s signs, in contrast, invariably were sited substantially farther back from the curb than the City’s street furniture signs. For example, two freestanding Fuel signs on Mission Street near Spear measured 16 feet, 7 inches from the curb to the near sign edge. At the same location, a Fuel sign mounted on a building wall and visible only to traffic on Mission Street was 59 feet, two inches from the curb; and a Fuel sign around the corner on the same wall, parallel to traffic on Spear Street and facing westbound traffic on Mission Street, was 15 feet from the curb. A pair of Fuel signs mounted on an armature in a “V” configuration on Polk Street near O’Farrell measured 15 feet to the curb, and a nearby pair of Fuel signs mounted on a hotel wall that faced a private driveway were at a considerably greater distance.

22. As discussed above, signs or other visual targets that are irrelevant to the driving task should not be located within the driver’s cone of vision. Yet the city signs were generally placed so close to the curb that they were clearly within the cone of vision of an approaching driver, whereas all of the observed Fuel signs were outside this field of view. As a result, I believe that the city signs created a higher level of potential distraction than the Fuel signs.

## 2. Size

23. Advertising panels on bus shelters measured approximately 66 inches tall by 45 inches wide, for a total image size of 2970 square inches. Advertising panels on triangular kiosks were of the same dimensions. Advertising panels on news racks were 4 feet, 10 inches long by 2 feet, 5 inches high, for a total image size of 1682 square inches. Advertising panels on round “public service” kiosks were approximately 11 feet 2 inches tall by 4 feet wide, for a total image size of 6336 square inches. Fuel’s panel signs (66 x 45 inches, 2970 square inches total) are of the same dimensions as advertising panels on bus shelters and triangular kiosks. Although signs on bus shelters and triangular kiosks were of the same dimensions as the Fuel signs, their proximity to the curb (and hence, the drivers’ line of sight) renders them far more likely than the Fuel signs to contribute to distraction. Advertising on round kiosks was even worse – because their proximity to the curb combined with their size (more than twice the visual area of the Fuel signs) provides a compelling stimulus for possible distraction. Of the city signs, only those on newsstands cause me less concern for potential distraction. This is because, despite their proximity to the curb, these signs are smaller than the others studied, and are lower to the ground and thus frequently blocked by other vehicles.

## 3. Elevation Above Grade

24. The distance from the grade level to the bottom of the visible image for advertising panels on bus shelters was approximately 11 ½ inches; for triangular kiosk signs it was 10 inches; for news racks it was 20 inches, and for round kiosks it was 22 inches.

25. Although the height above grade for Fuel signs is more variable, for the most part Fuel’s panel signs tend to be mounted significantly higher above grade than the City’s street furniture advertising signs. For the building mounted and free standing signs near the

intersection of Mission and Spear Streets, the height above grade was approximately 9 inches. However, for a pair of Fuel signs on an armature mounted to a building on Polk Street near O'Farrell, the bottom of the image was approximately 7 feet 10 inches above grade, and for a pair of Fuel signs mounted flat to the wall of a hotel building on Polk Street near Ellis, the bottom of the visible image was 11 feet 2 inches above grade.

26. Although the cone of vision is typically discussed in terms of a driver's horizontal scanning behavior, a sign's height above grade may also play a significant role in its distraction potential. As clearly shown in recent research (18), when a driver is (properly) scanning the environment for potential hazards, an irrelevant sign within this horizontal scanning pattern may become a distractor, and may interfere with proper scanning behavior. Signs that are located above a driver's line of sight for scanning are more easily ignored, and tend not to be observed unless and until the driver has the spare information processing capacity to divert some of his attention away from the road.

#### **4. Illumination**

27. The majority of the advertising panels in each of the categories I observed were illuminated at night. I did not have the necessary sophisticated equipment to measure the actual luminance levels of different signs, although they appeared to be illuminated to relatively similar degrees. Assuming equal luminance, larger signs and, particularly, signs closer to the curb and to the drivers' line of sight will appear brighter than smaller signs or those placed at a greater distance (horizontally and/or vertically) from the driver. Of course, lighting sources may become dim or burn out over time, and different advertisements may permit more or less light to shine through, thus making it difficult to generalize.

## Summary and Conclusions

28. During parts of two days and one evening, I visited 12 different San Francisco city street locations to observe examples of Fuel signs and those located on City-owned or controlled property including bus shelters, information kiosks, and news racks. I selected sites to visit that represented different localized environments in which drivers had to perform their principal tasks. I determined that there was considerable variation in the characteristics of sign size and placement that can contribute to the potential for driver distraction. In addition, certain characteristics of streets and intersections studied demonstrated that the task demands imposed on drivers is variable. Street and traffic characteristics that raised workload included: turning movements, steep hills, restricted sight lines, large numbers of tourists and other pedestrians, the need to share the street with bicycles, buses, trolleys, cable cars and other vehicles, and locations with many and confusing official traffic signs, signals and markings. A given advertising sign may cause little or no trouble in locations with low driver demands, yet may be quite inappropriate at other, more challenging locations.

29. With the exception of bus shelters, advertisements on City-owned or controlled structures appear to be placed based primarily on actual or perceived need. For example, kiosks (both triangular and round) seem to predominate in pedestrian and tourist areas such as Market Street and Fisherman's Wharf, whereas news racks tend to be prevalent near office buildings and along Market Street. Unfortunately, these advertisements on City structures seem to have been located without consideration for their potential impact on traffic safety. As a result, there exists, even in the limited sample of total signs that I was able to observe, a wide disparity between those advertising signs that may have little adverse impact on driver distraction and those which can clearly command attention at locations where drivers can ill afford to be distracted from the

driving task.

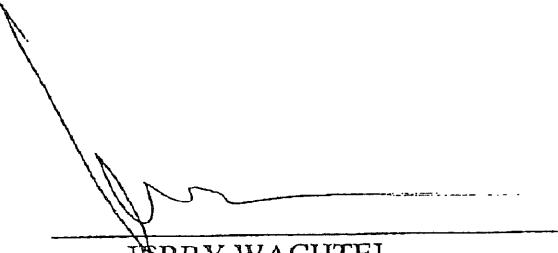
30. Conversely, the Fuel signs that I observed were, to a large extent, located on walls, posts, or other structures, that placed them, in every case, farther from the driver's cone of vision than any of the signs on City structures, and, often, considerably above the driver's line of sight used for (horizontal) scanning of the road and traffic environment. In the few locations where Fuel signs were located close to grade, the signs were considerably outside the driver's cone of vision either because they were set back from the curb by a considerable distance, or because they were mounted parallel to the direction of travel, thus requiring a large angular head turn to be readable. I observed no case in which a Fuel sign was as close to the curb, or as close to the center of an approaching driver's cone of vision, as any of the signs on City street furniture structures.

31. I conclude that, although there is a wide variation in the type and location of advertising signs that I observed during my site visits, the Fuel signs, without exception, cause me less concern about the potential for driver distraction than the signs on City structures, and this appears to result, in part, from the lack of appropriate safety criteria or review guidance established or used by the City for advertising signs vis a vis traffic safety issues caused by driver inattention or distraction.

32. Before the City acts to restrict or prohibit the advertising signs placed by one company, it should employ objective and neutral criteria that address the placement and display characteristics of all advertising signs visible to drivers within its jurisdiction.

33. I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated: July 17, 2008  
Oakland, California



JERRY WACHTEL

A handwritten signature in black ink, appearing to read "JERRY WACHTEL". The signature is written over a horizontal line and includes a stylized flourish at the top left.

# **EXHIBIT A**

JERRY A. WACHTEL, C.P.E.  
President, The Veridian Group, Inc.  
567 Panoramic Way • East Cottage • Berkeley, California 94704  
Tel: (510) 848-0250 • Fax: (510) 848-0303 • Email: jerwachtel@aol.com

## Curriculum Vitae

### **BACKGROUND AND EXPERTISE**

The Veridian Group was established in 1982 to provide consulting services to Government, non-profit and corporate clients in areas of human factors and ergonomics, including: human performance; visibility and conspicuity; hazards and warnings; simulation; training and assessment; expectancy and situation awareness, distraction and attention; roadway design and traffic control devices; and positive guidance concepts. Mr. Wachtel's background includes more than 30 years of experience in research, project management, and consulting at all levels of Government and in private industry.

### **EXPERT WITNESS QUALIFICATION.**

Mr. Wachtel has never been denied qualification as an expert witness in human factors, ergonomics, or engineering psychology. He has been retained as an expert in Alaska, Arkansas, California, The District of Columbia, Montana, New Jersey, Oregon, Pennsylvania, Virginia, and Washington.

### **PARTIAL CLIENT LIST.**

In addition to providing services to numerous law firms, our clients include

Government: U.S. Department of Transportation; U.S. Nuclear Regulatory Commission; County of Fairfax, VA; Cities of San Francisco, Baltimore, Seattle, Portland, Berkeley, and others; LA Department of Highways; MD State Highway Administration; NJ Department of Law and Public Safety; PA Department of Transportation; Port Authority of NY and NJ (PANY); Atlantic City Expressway Authority; League of Minnesota Cities; Association of Bay Area Governments (ABAG); California Department of Transportation (CALTRANS).

Corporate: AMFS, Inc.; Arco Chemical Co.; Atari Games Corp.; Drive Square, LLC; Electronic Learning Facilitators, Inc.; Hyperion Technologies, Inc.; I-Sim Corp.; Lamar Outdoor, Inc.; Parallax, Inc.; Positive Guidance Applications, Inc.; SAIC; Scientex Corp.; Systems Technology, Inc.; Talisman-International, LLC; Time-Warner Interactive; TransAnalytics, LLC; Vega Vista, Inc.

Educational and Non-Profit: Fondation MAIF, Paris, France; International Atomic Energy Agency (IAEA); National Safety Council; Sister Kenney Institute; Stein Gerontological Institute; University of California, Berkeley; University of Miami Center on Human Factors and Aging; University of Minnesota; Washington University of St. Louis; American Association of State Highway and Transportation Officials (AASHTO); Sharp Memorial Hospital Rehabilitation Center; Outdoor Advertising Association of America (OAAA); National Cooperative Highway Research Program (NCHRP); Scenic America.

**EMPLOYMENT HISTORY:****DRIVING LAB, LLC**

Co-Founder and Partner, 2007-Present

Driving Lab is a start-up company formed to address the growing need for a practical and valid assessment of driving impairments due to age, injury, or illness. The company is developing a line of standardized, state-of-the-art, affordable driving simulators, complete with proven assessment and training scenarios and protocols, for use in clinical, research, and DMV applications.

**U.S. NUCLEAR REGULATORY COMMISSION, Washington, D.C.**

Senior Engineering Psychologist, Training & Assessment Specialist, 1982-2000

Author of Federal regulations for fidelity and testing requirements for training simulators. Designed, developed and implemented agency-wide program in workplace ergonomics, and wrote policy paper on "Safety Conscious Work Environment." Managed multi-million dollar research programs in areas related to nuclear power plant simulation, training, procedures, and human factors engineering for advanced control rooms. Initiated, developed and defended research areas; developed contract documents and negotiated with offerors; managed all technical and financial aspects of research and technology transfer; explained and defended programs through the public hearing process; and published results. Developed and performed training and procedures reviews, control room design reviews, examination audits, incident response site-visits, simulator certification audits, and power plant staff interviews. Developed and maintained close, cooperative working relationship with industry.

Published and presented technical papers, chaired professional conferences, and served as invited keynote speaker. Appointed Chair, U.S. Technical Advisory Committee to International Standards Organization (ISO) Committee 159, SC6/WG8, Ergonomics of Control Centres. Served as NRC representative to American Nuclear Society committee writing the ANSI standard for nuclear power plant simulators. Conducted classes and workshops on human factors in the nuclear industry for international organizations in England, Norway, Sweden and Slovenia.

**U.S. DEPARTMENT OF TRANSPORTATION, Washington, D.C.**

Research Psychologist, 1973-82.

Developed and staffed a research laboratory using simulators and psycho-physiological recorders to conduct and manage highway safety research related to: accidents under reduced visibility conditions; driver task demands in the presence of roadside distractors; safety and traffic flow at bridge and tunnel entrances; real-time motorist guidance and information systems; adequacy of traffic control devices. Named Laboratory Director in 1980. My research results have been implemented throughout the US and Europe, and have been used as evidence in court cases, including the U.S. Supreme Court. Wrote and presented papers at conferences. Served on international committees concerned with highway safety. Appointed by the Secretary of Transportation to tasks force on Occupational Safety and Health and Transportation System Environmental Design. Chaired the simulation committee of the National Academy of Sciences' Transportation Research Board, and served as Chair of the Board's Human Factors Workshop in Transportation. Served the Human Factors and Ergonomics Society as Alternate Member of the National Committee on Uniform Traffic Control Devices.

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*Curriculum Vitae of Jerry Wachtel, C.P.E.*

GRUMMAN AEROSPACE CORPORATION, Bethpage, New York  
Human Factors Psychologist, 1969-73.

Served as NASA-Apollo Lunar Module (LM) Team Leader for simulation and real-time mission support. Developed and implemented man-in-the-loop simulation tests in support of flight crew training, procedures development, verification and validation, display/control design, and on-board maintenance activities. Supervised all corporate life sciences NASA support functions for Apollo flights including direction of a round-the-clock emergency response team of scientists and engineers, and conduct of post-mission astronaut debriefings. Wrote the human factors sections of corporate post-flight reports to NASA for Apollo missions. Researched the LM crew/computer interface, the results of which led to a reduction of in-flight errors during periods of high task demands. Discovered the problem and evaluated the effects of distance perception illusions experienced by astronauts on the lunar surface, which led to new equipment and procedures to reduce these effects. Wrote technical papers, and served as Grumman's representative to NASA lunar surface operations planning meetings. Consulted on other corporate projects, and contributed to the design of Grumman health care delivery systems and emergency medical treatment devices.

## **PROFESSIONAL APPOINTMENTS AND AFFILIATIONS**

Fellow, The Human Factors and Ergonomics Society

Member, Technical Groups on Forensics, Surface Transportation, Product Design,  
Visual Performance, Computer Systems, Health Care

Member, National Academy of Sciences, Transportation Research Board

Chair, Subcommittee on Roadside Digital Signage

Member Emeritus and former Chair, Committee on Simulation and Measurement of  
Vehicle and Operator Performance

Member, Committee on User Information Systems

Member, Committee on Vehicle User Characteristics

Chair, Fifteenth and Thirtieth Annual Workshop on Human Factors in Transportation

Member, Human Factors Workshop Planning Committee

Member of the following Scientific and Technical Committees:

Intelligent Transportation System (ITS) America, Committee on Safety and Human Factors.  
Society of Automotive Engineers, Committee on Human Factors.

Human Factors Resource Group, An Advisory Body to the National Committee on Uniform  
Traffic Control Devices, Authors of the MUTCD..

Advisory Board, Center on Human Factors and Aging Research - University of Miami School  
of Medicine.

U.S. Technical Advisory Group to International Standards Organization (ISO) TC159  
Ergonomics, and its Subcommittee 4, Ergonomics of Human-System Interaction.

Chair, U.S. Technical Advisory Group to ISO TC159/SC6, Ergonomics of Control Centres.

*Curriculum Vitae of Jerry Wachtel, C.P.E.***CERTIFICATIONS, HONORS AND AWARDS**

Certified Professional Ergonomist (CPE), Board of Certification in Professional Ergonomics

High Quality Performance Awards, U.S. Nuclear Regulatory Commission.

NASA Apollo Achievement Award for outstanding contributions to manned space flight.

Award for Outstanding Technical Achievement by the Federal Highway Administration for report titled: "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable Message Signage." (This publication was used as evidence by the Attorney General of the United States in a case heard before the U.S. Supreme Court).

Member of Psi Chi, the National Honor Society in Psychology.

**EDUCATION.**

Brooklyn College, Brooklyn, NY, B.A., Psychology, 1965

The City University of New York, New York, NY, M.B.A., Engineering/Industrial Psychology, 1969

The Stevens Institute of Technology, Hoboken, NJ, Advanced Graduate Studies in Engineering and Environmental Psychology

The Catholic University of America, Washington, DC, Advanced Graduate Studies in Human Factors and Engineering Psychology

**COMMUNITY SERVICE.**

President and Member of the Executive Board, Panoramic Hill Association, Berkeley, California.

Member of the Board, Friends of the Havens House, Berkeley, California

Director and Safety Chair, Berkeley Path Wanderers Association

Past President and Chairman, Federal Hill Neighborhood Association, Inc., a 501-C-3 organization representing a community of 3000 listed on the National Register of Historic Places.

Appointed by several Mayors of Baltimore City to membership on planning committees and tasks force, including: City Master Plan for the Year 2000 and Beyond; Downtown Stadium Committee; Key Highway Waterfront Advisory Committee.

**SELECTED PUBLICATIONS, PRESENTATIONS, AND PROFESSIONAL ACTIVITIES.**

Workshop Chair: "Digital Billboards on the Highway – Who's Watching?" 87th Annual Meeting of the Transportation Research Board of The National Academies. Washington, DC, January 2008.

"Programs and Practices to Reduce Simulator Sickness: Lessons Learned from the Field." *Proceedings of the International Conference on Road Safety and Simulation, 2007.* Rome, Italy: University of Roma Tre.

Reviewer: "Changeable Message Sign Displays During Non-Incident, Non-Roadwork Periods." National Cooperative Highway Research Program (NCHRP), Project 20-5, Topic 38-11, July 2007.

Principal Developer – International Standards Organization (ISO) Warning Symbol No. 21482, a symbol to warn the public of radiation dangers, February 2007.

(<http://www.iaea.org/NewsCenter/News/2007/radiationsymbol.html>)

Reviewer: *Preventing Teen Motor Crashes: Contributions from the Behavioral and Social Sciences: Workshop Report.* Washington, DC: The National Academies, January 2007.

"A Protocol for Avoiding Simulator Sickness." With E. Stern, V. Barth, W. Durfee, M. Rosen, T. Rosenthal, E. Schold-Davis, C. Schaffer, M. Watson, & J. Zola. Paper presented at the Conference on New Approaches to Simulation and the Older Operator, MIT AgeLab & New England University Transportation Center, October 27, 2006.

"Survey of Standards and Practices toward the Reduction of Simulator Sickness." Paper presented at the Conference on New Approaches to Simulation and the Older Operator, MIT AgeLab & New England University Transportation Center, October 27, 2006.

Invited Participant. U.S. Institute for Environmental Conflict Resolution: National Outdoor Advertising Control Program Assessment. Sacramento, California, August 2006. U.S. Department of Transportation, Federal Highway Administration.

Invited Presenter, "Hindsight Bias in Attribution of Crash Causes," Workshop on *Why Crashes Happen: Factors Associated with Crash Causation - Human Factors Insights from In-Depth Investigations,* 85<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington, DC, January, 2006.

"The Use of a Driving Simulator to Assess Senior Driver Performance: Increasing Situational Awareness Through Post-Drive One-on-One Advisement," with M. Romoser, D.L Fisher, R. Mourant, & K. Sizov. Proceedings of the 3<sup>rd</sup> International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design. Rockport, Maine: June 27-30, 2005.

Invited Moderator, Human Factors Issues. *The Crossing Zone – A Decade of Progress: Western Regional Safety Grade-Crossing Training Conference.* Organized by Federal Railroad Administration and University of California, Berkeley. May 2005.

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*Curriculum Vitae of Jerry Wachtel, C.P.E.*

“The Potential to Enhance Older Drivers’ Critical Driving Skills Through Simulator-Based Advice,” with M. Romoser, D.L. Fisher, K.A. Sizov, & R.R. Mourant. In *Driver Behaviour and Training: Vol. II*, L. Dorn, Ed. pp. 105-120. Hampshire, England: Ashgate.

“Safety Challenges Facing Tomorrow’s Commercial Drivers and the Role of New Simulation Technology to Meet Them.” Proceedings of the *Conference on Future Truck and Bus Safety Research Opportunities*. Washington, DC: Transportation Research Board of the National Academy of Sciences, March 2005.

“Use of a Driving Simulator to Assess Older Adults’ Critical Driving Skills,” with M. Romoser, D.L. Fisher, R. Mourant, K. Sizov, S. Kennedy, & M. Andra. Paper presented at the 84<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington, DC, January 2005.

“Making Vehicles and Roads Safer for Older Drivers: A Human Factors Approach.” Paper presented at the Symposium on Safe Mobility for the Aging, Sacramento, California, November 2004.

“Discriminating Between Brain Injured and Non-Disabled Persons: a PC-Based Interactive Driving Simulator Pilot Project,” with E.B. Stern, E. Schold Davis, W.K. Durfee, and T.J. Rosenthal. *Advances in Transportation Studies: An International Journal*, 2004 Special Issue, pp. 67-78

“Driving Simulation in the Clinical Setting: Utility for Testing and Treatment,” with P.N. Rosen. *Advances in Transportation Studies: An International Journal*, 2004 Special Issue, pp. 91-96

Invited Panelist, The Santa Monica Crash: Strategies to Reduce Future Occurrences. Joint Conference of the American Society on Aging and the National Council on Aging, April 2004.

Invited Participant, “International Consensus Conference: How to Assess Road Driving Skills and Abilities,” Sponsored by U.S. Public Health Service, Centers for Disease Control, December 2003.

“Assessment of Cognitively Impaired Persons Who Wish to Resume Driving.” The First STISIM Drive Users Group Meeting, Cranfield University, United Kingdom, September 2003.

“Driver Education for Pre-Teens: A New Approach Toward Reducing Crashes Among Young Novice Drivers.” In *Contemporary Ergonomics 2003*, P.T. McCabe (Ed.). London: Taylor & Francis.

“Pilot Study of Driving Simulation with Persons with Brain Injury and Cognitive Deficit,” with E.B. Stern, W.K. Durfee, T.J. Rosenthal, and E. Schold Davis. Presented at *World Federation of Occupational Therapy (13<sup>th</sup> World Congress of Occupational Therapists)*, Stockholm, Sweden, 2002.

“Program for Development of a New Warning Sign for Hazardous Radioactive Materials,” Consultant’s Report Prepared for the International Atomic Energy Agency (IAEA), March 2002.

“Drivers’ Responses to Changeable Message Signs of Differing Message Length, and Traffic Conditions,” with J.H. Guerrier and D.L. Budenz. In *Contemporary Ergonomics 2002*, P.T. McCabe (Ed.). London: Taylor & Francis, pp 223-228.

*Curriculum Vitae of Jerry Wachtel, C.P.E.*

“Low Cost Simulation as a Tool to Assess the Driving Ability of Persons with Cognitive Impairments from Brain Injury,” with E.B. Stern, W.K. Durfee, T.J. Rosenthal, and E. Schold Davis. In *Contemporary Ergonomics 2002*, P.T. McCabe (Ed.). London: Taylor & Francis, pp. 229-234.

*Ergonomics and the Prevention and Reduction of Injuries in the Workplace – Office Ergonomics 101-103.* U.S. Nuclear Regulatory Commission BR-0269, 0270, 0271, February 2002.

“Evaluation of a Low-Cost, PC-Based Driving Simulator to Assess Persons with Cognitive Impairments Due to Brain Injury,” with W.K. Durfee, T.J. Rosenthal, E. Schold-Davis and E.B. Stern. *Proceedings of the International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design*, Aspen, Colorado, August 2001, 293-294.

“A Simulator Study of Driver Responses to Changeable Message Signs of Differing Message Length and Format,” with J. Guerrier. *Proceedings of the International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design*, Aspen, Colorado, August 2001, 164-165.

Guest Lecturer. Graduate Class in Ergonomics and Engineering Psychology, San Jose State University, Spring 2001.

Invited Participant, *Federal Motor Carrier Safety Administration Meeting on Research and Technology*. Washington, DC, U.S. Department of Transportation, January 2001.

Invited Participant, “Conference on Partnering for Safety-Human Centered Systems – Operator Fatigue Management.” Tysons Corner, Virginia, U.S. Department of Transportation, August 2000.

“Human Factors Guidance for Control Room Evaluation,” with J. O’Hara, W. Brown, W. Stubler, J. Higgins and J.J. Persensky. In *Proceedings of the IEA 2000/HFES 2000 Congress*, San Diego, California, August 2000, 3-519 – 3-522.

Chair, Technical Session on “Human Factors Engineering Methods in Power Systems.” *IEA 2000/HFES 2000 Congress*, San Diego, California, August 2000.

*Single Point Urban Diamond Intersections in Maryland: A Review and Human Factors Analysis.* Maryland State Highway Administration, Office of Traffic Safety, June 2000.

Invited Participant, *Specialists’ Meeting on “Integrated Information Presentation in Control Rooms and Technical Offices at Nuclear Power Plants.”* Stockholm, Sweden, International Atomic Energy Agency (IAEA), May 2000.

Co-Chair, Workshop on “Signs that Confuse, Signs that Distract – The Impact of Official and Commercial Signs on Driver Behavior and Performance,” with M. Pietrucha. *33<sup>rd</sup> Annual Human Factors in Transportation Workshop*. Washington, DC, Transportation Research Board of the National Research Council, January 2000.

*Curriculum Vitae of Jerry Wachtel, C.P.E.*

"Interactive Driving Simulation as a Tool for Insight Development and Motivation in a Rehabilitation Setting," with Elin Schold-Davis. Paper presented at *The 8<sup>th</sup> Annual Medicine Meets Virtual Reality Conference*, Newport Beach, California, January 2000.

*The Towson Roundabout: Human Factors Considerations.* Maryland State Highway Administration, Office of Traffic Safety, August 1999.

Chair, Workshop on "Approaches for the Integration of Human Factors into the Upgrading and Refurbishment of Control Rooms." Organization for Economic Cooperation and Development of Europe (OECD). Halden, Norway, August 1999.

Chair, Workshop on "Safety Assessment of Plant Modifications with Special Emphasis on I&C Modernization and HMI Issues." International Atomic Energy Agency (IAEA). Ljubljana, Slovenia, May 1999.

Invited Presenter. *Corporate Traffic Safety Symposium.* Ft. Lauderdale, Florida: National Safety Council, South Florida Chapter, September 1997.

"Innovations in Low-Cost Simulation Technology for the Training and Testing of 'High Risk' Drivers," in *Global Perspectives of Human Factors in Power Generation: Proceedings of the 1977 IEEE Sixth Conference on Human Factors and Power Plants.* New York: Institute of Electrical and Electronic Engineers, June 1997.

Invited Member, Expert Peer Review Panel. *Validation of Truck Driver Simulator for Driver Training, Testing and Licensing.* U.S. Department of Transportation, Office of Motor Carriers, June 1997.

"Applications of Appropriate Simulator Technology for Driver Training, Licensing and Assessment." In *Vision in Vehicles - V*, A.G. Gale, et al, Eds. Amsterdam: Elsevier, pp. 3-10, 1996.

"A Comprehensive Evaluation of a Low Cost Driving Simulator for Use in the Training of Police Officers," with J. Berner. Presented at the *International Conference on Traffic and Transport Psychology*, Valencia, Spain, May 1996.

"An Enhanced Commentary Driving Technique for Real-Time Data Collection with Untrained Subjects," with J.H. Guerrier and P. Manivannan. Paper presented at the *International Conference on Traffic and Transport Psychology*, Valencia, Spain, May 1996.

"Human Factors Study of Traffic Control in Construction and Maintenance Zones," Three Working Papers Submitted to the Federal Highway Administration, U.S. Department of Transportation, under Contract No. DTFH61-95-C-00064, 1996.

"Human-System Interface Design Review Guideline, Final Report." *NUREG-0700, Rev. 1.* Washington, DC: U.S. Nuclear Regulatory Commission, June 1996.

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Curriculum Vitae of Jerry Wachtel, C.P.E.

"Technology and the Older Traveler." *Second National Forum for Advanced Public Transportation (APTS): New Thinking in Transit Management Concepts*, 8-11. Knoxville: The University of Tennessee Transportation Center, 1996.

"A Brief History of Driving Simulators." *TR News*, Number 179, July-August, pp. 26-27, 45, 1995.

"Human Factors in Process Control: Developing Criteria for the Review of Advanced Human-System Interface Designs." *CSERIAC Gateway VI(4)*, pp. 10-12, 1995.

"Methodological Issues in the Validation of Complex Human-Machine Systems," with J. O'Hara and W. Stubler. *Proceedings of the Topical Meeting on Computer-Based Human Support Systems: Technology, Methods, Future*. Philadelphia, PA, June 26-29, 1995, pp. 339-344.

*Positive Guidance in Maryland: Guidelines and Case Studies*. Contributing Author and Task Force Leader. Hanover, Maryland: Maryland State Highway Administration, 1995.

"The Importance of Simulation Facilities for the Development of Review Criteria for Advanced Human System Interfaces," with J.M. O'Hara. *Proceedings of the 1994 Simulation Multiconference*, J. Olmos and A. Sharon, Eds., pp. 200-205. San Diego: The Society for Computer Simulation, 1994.

"Development of Comprehensive Human Factors Engineering Guidelines for the Evaluation of Human Systems Interfaces," with J. O'Hara and W. Brown. *Proceedings of the 12th Triennial Congress of the International Ergonomics Association, Volume 5: Ergonomics of the Workplace*, Ontario, Canada: Human Factors Association of Canada, 1994, pp. 407-409.

"Driving Simulators - Serious Tools or Frivolous Toys? - Overview of a Symposium and Panel Discussion." *Proceedings of the Human Factors and Ergonomics Society 37th Annual Meeting*, Seattle: 1993, pp. 600-601, 622-624.

"The State of Practice of Computerized Operating Procedures in the Commercial Nuclear Power Industry," with A.J. Spurgin and P. Moieni. *Proceedings of the Human Factors and Ergonomics Society 37th Annual Meeting*, Seattle: 1993, pp. 1014-1018.

"The Role of New Simulation Technology in a Systematic Approach to Novice Driver Education." Paper presented at the *Working Conference on Novice Driver Education*, Edmonton, Alberta, Canada: April 1993.

"New Technology for an Old Problem: A Report of a Prospective Study to Evaluate a Simulator-Based Approach to Driver Licensing," with R.C. Peck. Paper presented at the 1993 Annual Meeting of the Transportation Research Board, Washington, DC: January 1993.

"An Introduction to Fitness for Duty." Invited paper presented at the 1993 Annual Meeting of the Transportation Research Board, Washington, DC: January 1993.

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Curriculum Vitae of Jerry Wachtel, C.P.E.

"Team Skills Training in Nuclear Power Plant Operations," with C.D. Gaddy, pp. 379-396, in Swezey, R.W. and Salas, E. (eds.) - Teams: *Their Training and Performance*. Norwood, N.J., ABLEX Publishing Co., 1992.

"A 'Blue Sky' Approach to the Future of Driver Qualification," with P.W. Nunnenkamp. Invited presentation to the 1992 Driver Licensing and Control Workshop. New Orleans: American Association of Motor Vehicle Administrators, November 1992.

"The Role of Simulators in the Operator Training Environment of the Future." Paper presented at the 2nd International Conference on Training for Operation and Maintenance in the Nuclear Industry, September 23, 1992. Cambridge, England: The Institution of Nuclear Engineers.

*Advanced Control Room Design Review Guidelines: Merging Old and New*, with R. J. Carter. Proceedings of the Human Factors Society 36th Annual Meeting, 1992.

Invited Participant: Workshop on Human Factors Research in Highway Safety, April 1-3, 1992. Washington, DC: National Academy of Sciences, Transportation Research Board.

"Guide Sign Effectiveness Review: An Assessment for the State of Maryland." March 1992.

"Simulator Technology: Analysis of Applicability to Motor Vehicle Travel." Collaborative author and Editor. *Transportation Research Circular Number 388*. Washington, DC: National Research Council/TRB, February 1992.

"Guidelines for the Review of Advanced Controls and Displays," with J.M. O'Hara. In *Transactions of the Nineteenth Water Reactor Safety Meeting* - NUREG/CP-0118, October 1991, pp. 11-9, 11-10.

Invited Participant: Workshop on Driver Vision Standards and Testing, October 4-5, 1991. Toronto, Ontario: Canada. Canadian Council of Motor Transport Administrators.

"Are We Training Operators Upside Down?" In *Proceedings of the Ninth Symposium on the Training of Nuclear Facility Personnel*, Denver, Colorado, April 14-18, 1991. Oak Ridge, Tennessee: Oak Ridge National Laboratory Report Number 9104135, pp. IV-B.1.1 - IV-B.1.12.

"The Development of Human Factors Review Criteria for Future Nuclear Power Plant Control Rooms," with J. O'Hara and J. Persensky. *Conference Record 1990 IEEE Nuclear Science Symposium*. Arlington, Virginia, 1990, pp. 909-913.

"Man-in-the-Loop Simulation in the Nuclear Industry: How Did We Get Here - Where Are We Headed?," Invited Keynote Address to The Society for Computer Simulation, Eastern Simulation Conference, Orlando, Florida, 1988.

"Operational Assessment of Simulator Fidelity in the Nuclear Industry," with C. Plott and K.R. Laughery. *Proceedings of the 32nd Meeting of the Human Factors Society*, Los Angeles, 1988.

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*Curriculum Vitae of Jerry Wachtel, C.P.E.*

"Evaluation Procedure for Simulation Facilities Certified Under 10 CFR 55," with C. Plott, K. Laughery and B. Gore. Washington, DC: U.S. Nuclear Regulatory Commission, *NUREG-1258*, 1987.

"Answers to Questions at Public Meetings Regarding Implementation of Title 10, Code of Federal Regulations, Part 55 on Operators' Licenses." Washington, DC: U.S. Nuclear Regulatory Commission, *NUREG-1262*, 1987.

"Using Simulators as Examination Tools." Paper presented at the Third IEEE Conference on Human Factors and Power Plants, Monterey, California, 1985.

"Adverse Highway Safety Consequences of New Technology," in *Ergonomics International 1985*, Edited by I.D. Brown, et. al. London: Taylor & Francis, 1985, 517-519.

"Federal Railroad Administration Experience and Rulemaking Activities with Regard to Fitness for Duty." Report to the Chairman and the Commissioners, U.S. Nuclear Regulatory Commission, 1985.

"The Future of Nuclear Power Plant Simulation in the United States," pp. 338-349, in Walton, D.G., *Simulation for Nuclear Reactor Technology*. Cambridge: Cambridge University Press, 1984.

Chair, "Transportation Safety," 27<sup>th</sup> Meeting of the Human Factors Society, Norfolk, Virginia, 1983.

"The Use of New Technologies for Visual Simulation." Invited Workshop. Washington, DC: Transportation Research Board, 1983.

"Electronic Advertising Near Highways: The Concern for Traffic Safety." *Public Roads*, 45(1), 1981.

Chair, "Performance and Vision." 24th Meeting of the Human Factors Society, Los Angeles, 1980.

"The Use and Abuse of Simulators in Environmental and Highway Design." Paper presented at the 24th Annual Meeting of the Human Factors Society, Los Angeles, 1980.

"The Highway Environmental Simulator, A White Paper." U.S. Department of Transportation, Federal Highway Administration, Highway Aesthetics Laboratory, 1980.

*Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable Message Signage*, with R.D. Netherton. Washington: U.S. Department of Transportation, 1980.

"Functions and Program of the FHWA Highway Aesthetics Laboratory." U.S. Department of Transportation, Federal Highway Administration, Washington, DC, 1980.

"Effects of Environmental Transitions on Highway Tunnel Operations and Safety." Paper presented at the U.S. Department of Transportation Conference on Research and Development in Underground Construction and Tunneling, Reston, Virginia, 1980.

*Curriculum Vitae of Jerry Wachtel, C.P.E.*

"Reduced Visibility on the Highway: A Pervasive Problem Receiving International Attention." *Transportation Research Circular 193*, 1978.

"The Escalating War on Reduced Visibility." *Public Roads*, 41(3), 1977.

"The Computer Generation: Options, At What Cost?" in R.E. Granda and J.M. Finkelman, eds., *The Role of Human Factors in Computers*. Proceedings of a Symposium Co-Sponsored by the Metropolitan Chapter of the Human Factors Society and Baruch College, 1976.

"Unobtrusive Measurement in Highway and Pedestrian Safety Research." Paper presented at the annual meeting of the American Psychological Association, Sponsored by Division 21, 1976.

"Remedial Aids to Deal with Driving in Reduced Visibility Caused by Adverse Weather," in *Adverse Weather, Reduced Visibility, and Road Safety*. Paris: Organization for Economic Co-Operation and Development (OECD), 1976.

"Contribution of Edge Striping to Accident Reduction," with J. True. U.S. Department of Transportation, Federal Highway Administration, 1973.

"Crew Systems Input - Apollo-16 Post-Flight Eval.," Grumman Aerospace Corp. LMO-480-888, 1972.

"Displays and Controls Subsystem, Space Shuttle Program," Grumman Aerospace Corp., 1972.

"Apollo 13 Debriefing Summary," with B. Kram, Grumman Aerospace Corp. LMO-480-563, 1970.

"Use of Crosspointers and Attitude Error Needles for Nulling of Horizontal Velocities at LM Touchdown," Grumman Aerospace Corp. LMO-480-810, 1970.

"Summary Recommendations of Evaluation of Rangefinder Device Proposed for Use on the Lunar Surface," with V. Gallagher, Grumman Aerospace Corp. LMO-480-736, 1970.

# **EXHIBIT B**

## APPENDIX 1 - REFERENCES

1. Author (2003). *Manual on Uniform Traffic Control Devices for Streets and Highways*. Washington, DC: U.S. Department of Transportation, Federal Highway Administration.
2. McKnight, J., and McKnight, A.S. (1991). *The Effect of Cellular Phone Use Upon Driver Attention*. Landover, MD: National Public Services Research Institute.
3. Strayer, D.L., Drews, F.A., & Johnston, W.A. (2003). "Cell Phone-Induced Failures of Visual Attention During Simulated Driving," *Journal of Experimental Psychology: Applied*, 9(1), 23-32.
4. Wierwille, W. W., Antin, J. F., Dingus, T. A., & Hulse, M. C. (1988). Visual attentional demand of an in-car navigation display system. In A. G. Gale, M. H. Freeman, C. M. Haslegrave, P. Smith, & S. P. Taylor (Eds.), *Vision in Vehicles II* (pp. 307-316). Amsterdam: North Holland Press.
5. Gellatly, A. W., & Kleiss, J. A. (2000). Visual attention demand evaluation of conventional and multifunction in-vehicle information systems. In *Proceedings of the IEA 2000/HFES 2000 Congress*, 3, 282-285. Santa Monica, CA: Human Factors and Ergonomics Society.
6. Dewar, R., & Olson, P. (2007). *Human Factors in Traffic Safety, Second Edition*. Tucson, AZ: Lawyers and Judges Publishing Company.
7. Shinar, D. (2007). *Traffic Safety and Human Behavior*. Amsterdam, The Netherlands: Elsevier
8. Wachtel, J. and Netherton, R. (1980). *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*. Report No. FHWA-RD-80-051. Washington, D.C: Federal Highway Administration.
9. Farbry, J., Wochinger, K., Shafer, T., Owens, N, and Nedzesky, A. (2001). *Research review of potential safety effects of electronic billboards on driver attention and distraction (Final Report)*. Washington, DC: U.S. Department of Transportation, Federal Highway Administration, Human Centered Systems Team..
10. Bergeron, J. (1996). "An Evaluation of the Influence of Roadside Advertising on Road Safety." *Document Prepared for the Ministere des Transports, Government of Quebec*.
11. Wallace, B. (2003). "External-to-vehicle driver distraction." *Research Findings No.168/2003, Scottish Executive Social Research, Development Department Research Programme*.
12. Young, K., & Regan, M. (2003). "Road Safety Implications of Driver Distraction," *Australian Road Safety Handbook, Vol. 2*. Sydney: Austroads.

13. Stutts, J.C., Reinfurt, D.W., Staplin, L., & Rodgman, E.A. (2001) *The Role of Driver Distraction in Traffic Crashes*. Washington, DC: AAA Foundation for Traffic Safety.
14. Code of Federal Regulations (1998). "Title 23, Volume 1, Highways, Part 750 – Highway Beautification," *23CFR750*. Washington, DC: U.S. Government Printing Office.
15. Smiley, A., Persaud, B., Bahar, G., Mollett, C., Lyon, C., Smahel, T., & Kelman, W.L. (2005). Traffic Safety Evaluation of Video Advertising Signs. *Transportation Research Record: Journal of the Transportation Research Board*, No. 1937, pp. 105-112. Washington, DC: TRB.
16. Lee, S.E., McElheny, M.J., & Gibbons, R. (2007). *Driving Performance and Digital Billboards. Report prepared for Foundation for Outdoor Advertising Research and Education*. Blacksburg, Virginia: Virginia Tech Transportation Institute.
17. Dingus, T. A., Klauer, S. G., Neale, V. L., Petersen, A., Lee, S. E., Sudweeks, J., Perez, M. A., Hankey, J., Ramsey, D., Gupta, S., Bucher, C., Doerzaph, Z. R., Jermeland, J., and Knipling, R.R. (2006). *The 100-Car Naturalistic Driving Study: Phase II – Results of the 100-Car Field Experiment*. (Report No. DOT HS 810 593). Washington, D.C.: National Highway Traffic Safety Administration
18. Crundall, D., Van Loon, E., & Underwood, G. (2006). Attraction and distraction of attention with roadside advertisements. *Accident Analysis and Prevention*, 38 (4), 671–677.